A NEW SUBSPECIES OF LUPINUS BURKEI

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Several years ago a lupine collected by Arthur Kruckeberg (*2485*—MONT), from the Blue Mountains of Oregon was received on a loan. This specimen differs from any taxon in *Lupinus* known from the western United States, and we viewed it as a new taxon or possibly of hybrid origin. For three years we unsuccessfully sought this lupine in the field, and finally located it in 1971.

Although the area was still under snow in late June, and the plants had a radical cluster of leaves with a solitary subscapose flowering culm by late July, fruits were developed by mid-August. For perennial lupines to develop mature legumes from early anthesis in three weeks is very rapid.

The population extends continuously about a mile to one and a half miles along Oregon State Highway 204 near the highest point between Langdon Lake and Elgin, Union Co. The lupine appears to have a restricted, isolated niche at this high point in the heart of the Blue Mountains, an area that has a dense forest of mature spruce, larch, and lodgepole pines that holds the snow longer than open areas.

Extensive morphological study of this lupine indicated similarities with several other taxa and suggested relationship either with the *Lupinus latifolius* complex or the *Lupinus polyphyllus* complex. The Oregon plants (fig. 1) are most closely related to *L. burkei* (of the *L. polyphyllus* complex), but differ from other populations of this species in various morphological details (Table I). *Lupinus burkei* subsp. *burkei* and *L. polyphyllus* are illustrated elsewhere (Dunn & Gillett, 1966). Due to the morphological, biochemical, and ecological distinctiveness, relative geographical isolation, and well established nature of this Oregon Blue Mountain lupine, we have discarded immediate hybrid origin as an explanation for its origin and describe it herein as *Lupinus burkei* subsp. *caeruleomontanus*.

Since seed alkaloids have proven beneficial in comparing perennial lupine affinities (Cox, 1972), comparisons of *Lupinus burkei* ssps. *burkei* and *caeruleomontanus, L. polyphyllus,* and *L. latifolius* were made employing the methods of extraction and plating described by Cox (1972).

The TLC (silica gel—G) solvent system that proved most successful in separating the greater number of alkaloids was adapted from Cho & Martin (1971) and consisted of chloroform/methanol/ammonia (95:4:1). Average Rf values were calculated by analyzing six to ten populations of each taxon, with the exception of *caeruleomontanus,* of which only two samples were available from populations separated by approximately

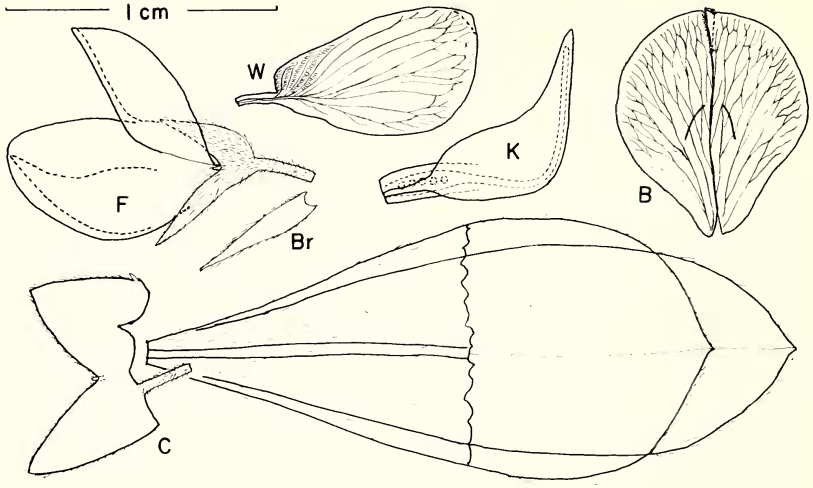

FIG. 1. Floral parts and a typical leaflet of *Lupinus burkei* subsp. *caeruleomontanus*. The flower viewed from the left side–F, banner–B, wing–W, keel–K, calyx, cut along the left lateral sinus, unfolded and the inside view shown–C, and a bract–Br, are illustrated. All parts are drawn to the typical conformation of the structure with the size the mean value of the measurements of fully developed flowers with one measurement from each of 25 plants from population samples of two locations. Leaflets drawn to one-third the scale shown for the floral parts.

one mile. Several plants from each population were also analyzed to test the intrapopulational variation of the alkaloids. Reference compounds of lupanine, sparteine, 13-hydroxylupanine and 17-oxolupanine were gifts of Professors Y. D. Cho and R. O. Martin, University of Saskatchewan. Alkaloids were visualized and identified by spraying with both Dragendorff and iodoplatinate reagents.

The alkaloids of *caeruleomontanus* are more similar to those of *L. burkei* subsp. *burkei* than to other taxa examined (Table 2).

Lupinus burkei Wats. subsp. **caeruleomontanus** Dunn & Cox, subsp. nova.

Holotype: Oregon; Union Co., Near divide, between Langdon Lake and Elgin, south of Woodland Campground, northwest-facing roadcut, Aug. 19, 1971, *Dunn 18278* (UMO). Isotypes will be distributed to: CAS, DS, F, GH, K, MO, NY, ORE, OSC, RM, RSA, UC, US, WIS, WS, & WTU. Paratypes: *Dunn 18276* (same herbaria as *18278*); *Kruckeberg 2485* (MONT).

Plantae perennes, 2–3 dm altae sub anthesi, 4–5 dm sub fructu; caulibus gracilibus, cavis, 2–3 mm diametro, span-strigulosis, unifolius in caule sub anthesi racemi primarii; foliis multis radicalibus; petiolis ad 15 cm longis; foliolis 6–7, obovatis, supra glabris, maximis 4.5–6.0

TABLE 1. DIAGNOSTIC MORPHOLOGICAL TRAITS OF THE SUBSPECIES OF LUPINUS BURKEI AND SIMILAR TAXA.

Diagnostic Traits	Taxa			
	L. burkei ssp. *caeruleomontanus*	*L. burkei* ssp. *burkei*	*L. polyphyllus*	*L. latifolius*
Plant height (dm)	2–3	4.5–9.0	5–15	3–12
Cauline nodes	1–3	3–4	3–5	over 6
Leaflet No.	6–7	7–11	10–17	7–9
Leaflet length (cm) (largest)	4.5–6.0	4–10	7–15	4–10
Petiole length (cm) (longest)	10–14	15–30	14–62	3–10
Flower length (mm)	8–10	12–14	12–14	10–14
Bracts	caducous	generally persistent	caducous	caducous
Bract length (mm)	4–6	10–15	10–13	8–12
Pedicel length (mm)	2	2–4	5–15	6–12
Keel	glabrous	glabrous or ciliate at midpoint	glabrous	ciliate near claws
Pod length (cm)	1.5–1.8	2–3	2.5–5.0	3
Seed No.	4–6	6–8	6–10	7–10

Table 2. Distribution of Alkaloids Among Lupinus Taxa

A. R_f values and relative amounts observed (t = trace, + = small, ++++ = copious). Unidentified alkaloids are numbered.

		Taxa			
Alkaloid	R_f	*L. burkei* ssp. *caeruleomontanus*	*L. burkei* ssp. *burkei*	*L. polyphyllus*	*L. latifolius*
1	.00	t	t	t	t
2	.01	t	t	t	
Sparteine	.08		+		
4	.12	+	++		
13-Hydroxy-lupanine	.21		++		
6	.23	t	t		
7	.33	+	+		
Angustifoline	.46		+		
9	.49	t	t		
10	.57	+++	++	+	
Lupanine	.70	++	+++	++++	
12	.79	+++	++		++++

B. Percent similarity of alkaloids of these taxa.

Taxa	*caeruleomontanus*	*burkei*	*polyphyllus*	*latifolius*
caeruleomontanus	100			
burkei	75	100		
polyphyllus	44	33	100	
latifolius	22	17	20	100

cm longis, 15–22 mm latis; pedunculis 7–10 cm longis; racemi verticillati ad subverticillatos; bracteis 4–6 mm longis, caducis; pedicellis 2–3 mm longis; calycibus bilabiatis, labiis ambobus integris generaliter, bracteolis in sinis lateralibus 0.1–0.7 mm longis; floribus subviolaceis ad subazulinos praeter apicem carinae atropurpureum; vexillo obovato, 7.6–9.2 mm longo, 6.0–8.4 mm lato, reflexo prope in medium; carina glabra, angula 90–112°; leguminibus 15–18 mm longis, 5.0–5.5 mm latis; seminibus 4–6, 4 mm longis, 3 mm latis.

Plants perennial, 2–3 dm tall at anthesis, elongating to 4–5 dm by fruiting; stems slender, hollow, 2–3 mm dia., sparsely strigulose, one cauline leaf at anthesis of the primary raceme, 2–3 by fruiting; multiple radical leaves with petioles to 15 cm long; stipules of cauline leaves 2.0–4.5 mm long, connate to petioles 1–2 mm; leaflets 6–7, obovate to broadly oblanceolate, tip mucronate, glabrous above, very sparsely strigulose below, largest 4.5–6.0 cm long, 15–22 mm wide; peduncles 7–10 cm long; racemes verticillate to subverticillate, internodes 6–11 mm distant; bracts lance-attenuate, 4–6 mm long, caducous; pedicels 2 mm long at anthesis, 2.5–3.0 mm in fruit, sparsely spreading pilose hairs 0.2–0.3 mm long; calyx sparsely pilose without, glabrous within, the lips commonly both entire, or the upper lip with a notch 0.1–0.8 mm deep, the lower-lip 3.8–5.6 mm long, upper-lip 3.4–5.2 mm long, bracteoles at lateral sinuses 0.1–0.7 mm long, attached near the sinus lip, lips connate laterally 1.2–2.0 mm; corolla glabrous, pale lavender-blue, except the keel-tip deep purple; banner obovate, 7.6–9.2 mm long, 6–8.4 mm wide, reflexed 3.6–4.6 mm, appressed 3.8–5.4 mm, reflexed/appressed ratio 0.8–1.0 (av. 0.87), the angle 117–133°; wings 8.0–10.2 mm long, 3.8–5.1 mm wide, the claws 1.4–1.8 mm long; keel 2.6–3.0 mm wide at midpoint, the tip slender, deep purple, the rest white, the angle 90–112°; pods 5.0–5.5 mm wide, 15–18 mm long, with pilose hairs 1–2 mm long; ovules 4–6; mature seeds 4 mm long, 3 mm wide, finely mottled dark brown on cream colored background.

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